8627

Power Triode

NUVISTOR TYPE

ENVIRONMENTAL TESTS **LIFE TEST**

For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 Gc/s in Aircraft, Industrial, Military, and Other Equipment Operating Under Conditions of Severe Shock and Vibration.

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_f	6.3	V
Heater Current at E_f = 6.3 V.	I_f	150	mA
Heater Input.	P_f	0.95	W
Direct Interelectrode Capacitances			
Without external shield			
Input: K to (G,S,H)	c_i	6.0	pF
Output: P to (G,S,H)	c_o	1.2	pF
Heater to cathode	c_{hk}	1.4	pF

Class A_1 Amplifier

For following characteristics, see Conditions

Amplification Factor.	μ	60	70	
Plate Resistance (Approx.).	r_p	6300	5400	Ω
Transconductance.	g_m	9500	13000	μmho
DC Plate Current.	I_b	9	11.5	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-	-5	V

Conditions

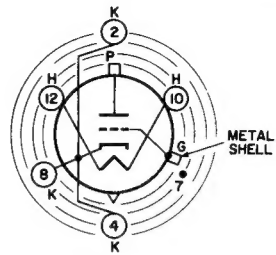
Heater Voltage.	E_f	6.3	6.3	V
Plate Supply Voltage.	E_{bb}	150	110	V
Grid Supply Voltage	E_{cc}	0	0	V
Cathode Resistor.	R_k	150	47	Ω

MECHANICAL CHARACTERISTICS

Operating Position.	Any
Type of Cathode	Coated Unipotential
Minimum Overall Length (l_m).	0.985 in
Maximum Seated Length (l_{sm})	0.780 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.).	2.2 g
Dimensional Outline	JEDEC No.4-6
Envelope.	JEDEC MT4
Top Cap[a].	Small (JEDEC C1-44)
Base[b]	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)

Basing Designation for BOTTOM VIEW. 12CT

Pin 2 – Cathode
Pin 4 – Cathode
Pin 7[c] – Do Not Use
Pin 8 – Cathode
Pin 10 – Heater
Pin 12 – Heater
Metal Shell – Grid
Top Cap – Plate



INDEX = LARGE LUG
• = SHORT PIN—IC

ABSOLUTE MAXIMUM RATINGS

For Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Tube Operation at frequencies up to 1.2 Gc/s

		CCS[d]	*ICAS*[e]	
Plate Supply Voltage	E_{bb}	500	500	V
DC Plate Voltage	E_b	250	300	V
Grid Voltage				
Peak positive value	e_{cm}	4	5	V
DC positive value	E_c	0	0	V
DC negative value	E_c	-100	-100	V
Peak Heater-Cathode Voltage	e_{hkm}	±100	±100	V
Heater Voltage, AC or DC	E_f	5.7 to 6.9	5.7 to 6.9	V
Instantaneous Voltage Between top cap or base pins and metal shell		See *Breakdown-Voltage Characteristics* Curve		
Average Grid Current	$I_{c(av)}$	5	6	mA
Average Cathode Current	$I_{k(av)}$	25	30	mA
Plate Dissipation	P_b	2.5	2.7	W
Envelope Temperature	T_E	200	200	°C

MAXIMUM CIRCUIT VALUES

		CCS	*ICAS*	
Grid-Circuit Resistance For fixed-bias or cathode-bias operation:	$R_{g(ckt)}$			
For $T_E \leq 150°$ C		50	50	kΩ
For $T_E > 150°$ C		See *Grid-Circuit-Resistance Rating Chart*		

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TYPICAL OPERATION — CCS

As Cathode-Drive RF Power Amplifier

Frequency	f	1	1.2	Gc/s
Heater Voltage	E_f	6.3	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	180	180	V
DC Cathode-to-Grid Voltage	E_{kg}	5.5	5.5	V
From grid resistor of	R_g	1200	1200	Ω
Average Plate Current	$I_{b(av)}$	20	20	mA
Average Grid Current	$I_{c(av)}$	4.5	4	mA
Driving Power (Approx.)	P_g	150	250	mW
Useful Power Output (Approx.)[g]	P_o	1.4	1.2	W

As RF Oscillator

Frequency	f	1	Gc/s
Heater Voltage	E_f	6.3	V
DC Plate Voltage	E_b	180	V
DC Grid Voltage	E_c	-5.5	V
From grid resistor of	R_g	1200	Ω
Average Plate Current	$I_{b(av)}$	21	mA
Average Grid Current	$I_{c(av)}$	4.5	mA
Useful Power Output (Approx.)[g]	P_o	1.25	W

As Cathode-Drive Frequency Doubler

Output Frequency	f_o	1	Gc/s
Heater Voltage	E_f	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	180	V
DC Cathode-to-Grid Voltage	E_{kg}	8.5	V
From grid resistor of	R_g	1200	Ω
Average Plate Current	$I_{b(av)}$	18.5	mA
Average Grid Current	$I_{c(av)}$	3	mA
Driving Power (Approx.)	P_g	300	mW
Useful Power Output (Approx.)[g]	P_o	0.7	W

[a] Designed to mate with "1/4-inch" connector generally available from your local RCA Distributor.

[b] Designed to mate with Cinch Mfg. Co. socket No.133 65 10 041, Cinch-Jones Sales-Division Distributor socket Designation SNS-3, or equivalent.

[c] Pin 7 is of a length such that its end does not touch the socket insertion plane.

[d] Continuous Commercial Service.

[e] Intermittent Commercial and Amateur Service. No operating or ON period exceeds 5 minutes and every ON period is followed by an OFF or standby period of the same or greater duration.

[f] Measured on metal shell in Zone "A" (See *Dimensional Outline*).

[g] Measured at load.

INITIAL CHARACTERISTICS LIMITS

	Note	*Min*	*Max*	
Heater Current	1	140	160	mA
Direct Interelectrode Capacitances	2			
Cathode to plate	-	-	0.046	pF
Input: K to (G,S,H)	-	5.0	7.0	pF
Output: P to (G,S,H)	-	0.9	1.5	pF
Heater to cathode	-	1.1	1.7	pF
Amplification Factor	3	50	90	

	Note	Min	Max	
Transconductance (1)	4	7500	11500	μmho
Transconductance (2)	3	10500	15500	μmho
Plate Current (1)	4	6.5	11.5	mA
Plate Current (2)	3	8.5	14.5	mA
Cutoff Plate Current	5	-	50	μA
Useful Power Output	6	1.1	-	W
Total Grid Current	7	-	-0.1	μA
Heater-Cathode Leakage Current	8	-	±5	μA
Leakage Resistance				
Between grid and all other electrodes connected together	9	5	-	GΩ
Between plate and all other electrodes connected together	10	10	-	GΩ
Inoperatives	11		✓	

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield.

Note 3: With E_f = 6.3 V, E_{bb} = 110 V, E_{cc} = 0 V, R_k = 47 Ω, C_k = 1000 μf.

Note 4: With E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = 0 V, R_k = 150 Ω, C_k = 1000 μf.

Note 5: With E_f = 6.3 V, E_b = 150 V, E_c = -7 V.

Note 6: Measured at load in cathode-drive rf-power-amplifier circuit with f = 1 Gc/s, E_f = 6.3 V, E_{bg} = 175 V, E_{kg} = 6 V from R_g = 1200 Ω, $I_{b(av)}$ = 23 mA max, $I_{c(av)}$ = 5 mA max, P_g = 150 mW, circuit tuned for maximum $P_{o(useful)}$.

Note 7: With E_f = 6.3 V, E_b = 150 V, E_{cc} = -1.3 V, R_g = 0 Ω.

Note 8: With E_f = 6.3 V, E_{hk} = ±100 V.

Note 9: With E_f = 6.3 V, $E_{g\text{-}all}$ = -100 V.

Note 10: With E_f = 6.3 V, $E_{p\text{-}all}$ = -300 V.

Note 11: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

ENVIRONMENTAL TESTS

High-Impact, Short-Duration Shock

	Min	Max	
Peak Impact Acceleration		1000	g
Duration of approximate half-sine-wave mechanical-shock pulse		0.8 ± 0.2	ms
Operating Conditions during Test			
E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = -1.3 V, R_g = 50 kΩ, E_{hk} = 100 V			
Post-Shock Limits and Rejection Criteria	*Min*	*Max*	
$\Delta 1_{gm}$	-	±15	%
I_c	-	-0.1	μA
I_{hk}	-	±10	μA
ER_{pm} (Variable-Frequency-Vibration Test Limits) over vibration-frequency range of:			
3 to 6 kc/s	-	100	mV
6 to 15 kc/s	-	1000	mV
Tap and Permanent Shorts, and Discontinuities	✓		

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Low-Impact, Long-Duration Shock

Peak Impact Acceleration	50	g
Duration of approximate half-sine-wave mechanical-shock pulse	11 ± 2	ms

Condition during Test
No tube-element voltages are applied.

Post-Shock Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s
Peak Displacement (5 to 50 and 50 to 5 c/s)	0.040	in
Peak-to-peak value	0.080	in
Peak Vibrational Acceleration (50 to 500 to 50 c/s)	10	g
Period of 1 sweep cycle (Approx.) (5 to 500 to 5 c/s)	15	m
Duration of Test (Overall)	9	h
Along each of 3 mutually perpendicular axes	3	h

Operating Condition during Test
E_f = 6.3 V

Post-Sweep-Frequency-Vibration-Fatigue Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Variable-Frequency Vibration

Vibration-Frequency Range (Overall)	3 to 15		kc/s
Peak Vibrational Acceleration in X_1 position	1		g
Period of 1 sweep cycle (3 to 15 kc/s)	7		s

Operating Conditions during Test
E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = 0 V, R_k = 150 Ω, R_p = 2 kΩ

Limits	*Min*	*Max*	
E_{Rpm} over vibration-frequency range of:			
3 to 6 kc/s	-	80	mV
6 to 15 kc/s	-	700	mV

LIFE TESTS

Heater Cycling

Duration of Test	2000	cycles

Operating Conditions
E_f = 8.5 V cycled 1 minute ON and 2 minutes OFF, E_{hk} = −180 V continuously ON

Rejection Criteria
Heater-cathode shorts, and heater and cathode discontinuities

Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

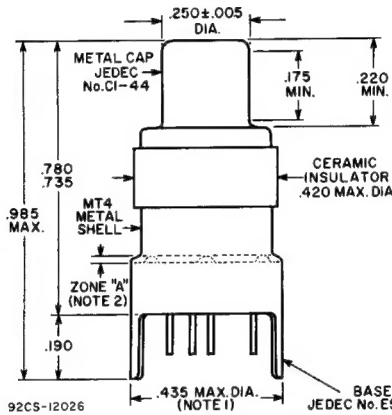
Operating Conditions

E_f = 6.3 cycled 110 minutes ON and 10 minutes OFF,
E_{bb} = 150 V, E_{cc} = 0 V, R_g = 50 kΩ, P_b = 2.4 W,
T_E = 150° C min

End-Point Limits At	2 and 20		100		500		1000		h
	Min	Max	Min	Max	Min	Max	Min	Max	
$1g_m$	-	-	6700	-	-	-	-	-	μmho
$\Delta 1g_m/t$.	-	±10	-	-	-	-	-	-	%
P_o(useful). . .	-	-	-	-	1.0	-	0.9	-	W
I_c.	-	-	-	-0.2	-	-	-	-	μA

DIMENSIONAL OUTLINE

JEDEC No.4-6



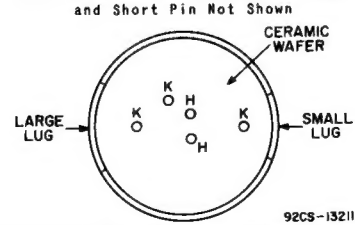
DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pin Not Shown



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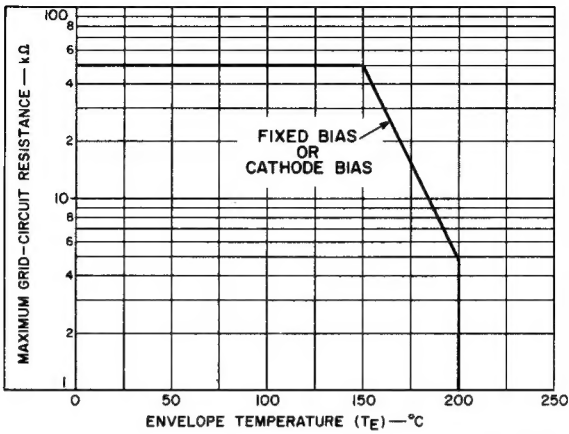
Grid-Circuit-Resistance Rating Chart



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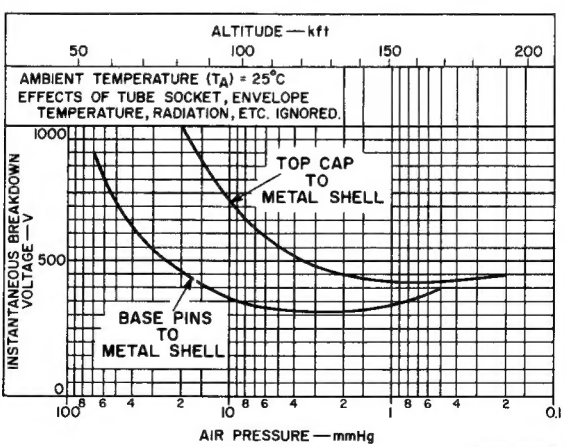
Breakdown-Voltage Characteristics



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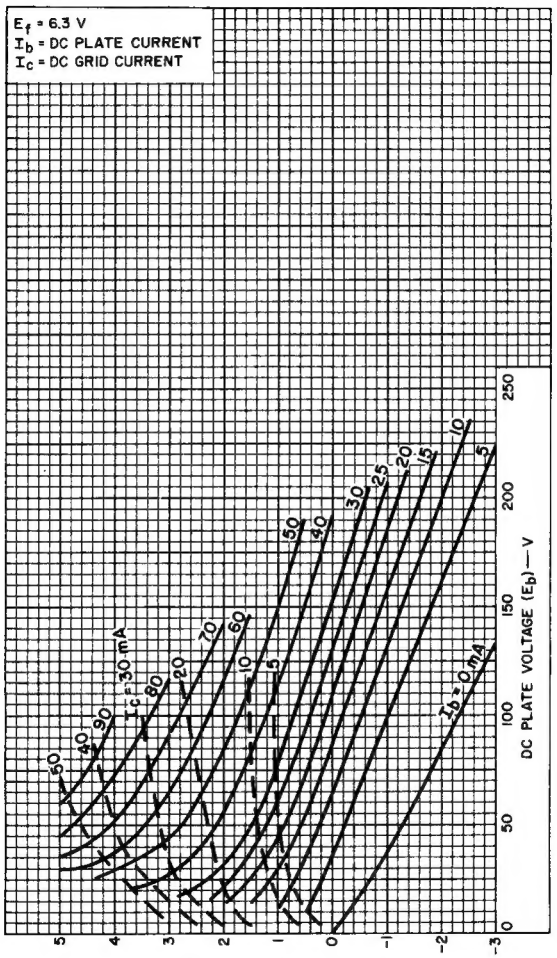
Typical Constant-Current Characteristics



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Typical Characteristics